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Result Page

[0001] The invention concerns a laminar, rolled semi-finished material from an aluminum alloy, whereby the aluminum alloy exhibits the following alloy portions in weight percentage:
2 ? mg ? 5

Mn ? 0,5

CR ? 0,35

SI ? 0,4

Fe ? 0,4

Cu ? 0,3

Zn ? 0,3

Ti ? 0,15
other one in sum maximally 0.15, individually maximally 0.05, remainder of aluminium, whereby the semi-finished material from an ingot was shifted and during the rolling process at least an intermediate annealing between two cold-rolling passes as well as and in a chamber furnace a procedure for the production of such a laminar, rolled semi-finished material was subjected to a conclusion annealing in each case.

[0002] With these laminar, rolled semi-finished material it acts around aluminium strips or - sheet metals for subsequent treatment by deforming and/or. Deep-drawing for example for the production of autobody sheets for the automobile industry. It is well-known that standard alloys like e.g. AA5052, AA5754 or AA5182, which exhibit alloy portions within the indicated ranges, with the deep-drawing susceptibly to the formation of flow figures, in particular flow lines, are. Such flow figures are to a considerable degree unwanted for elevated requirements to the surface with body outer parts that they are still visible also after painting.

[0003] From the state of the art beyond that different beginnings are well-known, to a reduction and/or. complete avoidance of the unwanted flow lines after deforming and/or. Deep-drawing lead. Here to call in particular the additive of Zn and/or cu is, escapes the intermediate annealing and/or the conclusion annealing in the continuous furnace. The attitude of the grain size by the additive of Zn and/or cu leads to an increase of the risk that when deforming and/or. Deep-drawing a so-called orange peeling, develops. During missing intermediate annealing increased requirements develop to the cold-rolling process and/or. the pre-aged hot-rolling process, since the reductions per pass are reduced when cold-rolling. The use of a continuous furnace is finally at least connected with high initial costs.

▲ top

[0004] Furthermore patent specification US 4.151.013 a manufacture procedure is well-known for semi-finished material for the avoidance of flow lines when deforming or deep-drawing of semi-finished material from US, with which an ingot from an aluminum alloy is cold-rolled after hot-rolling directly or after an intermediate annealing with a thickness reduction of at least 40%, mostly 60% - 80%, to a semi-finished material, afterwards the semi-finished material in a continuous furnace a conclusion annealing is submitted and around 0,25% to 1% is finally strained. It was however shown that with the well-known procedure manufactured semi-finished material do not ensure a safe avoidance of flow lines for example in a following deep-drawing.

[0005] On the basis of the state of the art described before the available invention the task is the basis, a laminar, rolled semi-finished material from an aluminum alloy and/or. a procedure for the production of a such laminar to make available rolled semi-finished material which makes the use of standard alloys possible without additive of Zn and cu or other elements, without complex manufacturing plants gets along and an improved process security regarding a flow line liberty of the punched and/or. deformed final product ensured.

[0006] And the shown task deduced before is solved in accordance with the first theory of the invention by the fact that the strain before the first intermediate annealing at least 50% and before the conclusion annealing amounts to at the most 30% and was strained the semi-finished material after the conclusion annealing around 0,1 to 0.5%.

[0007] First by a high strain of at least 50% before the first intermediate annealing a rough structure in the semi-finished material is produced, so that the recrystallisation temperature of the aluminum alloy is lowered and as complete a recrystallisation of the semi-finished material as possible takes place at the intermediate annealing. During following cold-rolling with a maximum strain of 30% only few defects are brought recrystallized semi-finished material into the soft, so that the semi-finished material with a fine-grained structure is supplied to the conclusion annealing. By the combination preceded of the processing steps with locking straining and the characteristics of the alloy it is ensured

surprising way that when deforming and/or. Arise to deep-drawing of the semi-finished material no flow lines. Beyond that the semi-finished material according to invention exhibits a long bearing endurance of several years, while those the characteristics change not substantially. In particular it is not necessary to stop a special grain size so that the risk of the occurrence of an orange peeling when deforming is void. Thus a flow line liberty can be obtained also with grain size under 50 mu m. Finally is no soft and/or. Solutionizing in the continuous furnace with following deterrence necessarily. In summary it can be said that the manufacturing process exhibits a large robustness for the production of the laminar, rolled semi-finished material according to invention.

[0008] A favourable arrangement experiences the laminar, rolled semi-finished material according to invention by the fact that the semi-finished material was strained after the conclusion annealing around 0,2 to 0.5%. Straining around at least 0.2% increases far process security with the production of the semi-finished material according to invention.

[0009] Straining the laminar, rolled semi-finished material can take place in different way. Conceivable for example straining in a volume stretching equipment in addition, straining are with the help of by alternate returning of the volume and/or. Sheet metal in a so-called Levelling plant, with which the volume is strained with each detour on the outside radius and tossed inside radius.

[0010] If the semi-finished material exhibits a coating later applied using the Coil Coating procedure, then the ductility of the semi-finished material in following deformation or deep-drawing steps can be improved, without impairing the flow line liberty by the associated thermal treatment.

[0011] In accordance with second theory of the invention and the shown task deduced before is subjected to an intermediate annealing between two cold-rolling passes and a conclusion annealing in each case by a procedure for the production of a laminar, rolled semi-finished material from an aluminum alloy solved, with which the semi-finished material from the alloy portions indicated above exhibiting ingot is shifted, during the rolling process at least in a chamber furnace, whereby the strain before the first intermediate annealing at least 50% and before the conclusion annealing amounts to at the most 30% and is strained the semi-finished material after the conclusion annealing 0.1 to 0.5%.

[0012] As implemented above, according to invention the semi-finished material manufactured in the procedure exhibits far improved process security regarding the avoidance of flow lines with following deforming or deep-drawing of the semi-finished material.

[0013] There is now a multiplicity of possibilities, the laminar, rolled semi-finished material in accordance with the first theory of the inventlon and/or. the procedure for the production of a such laminar to out-arrange and train further rolled semi-finished material in accordance with the second theory of the invention. For this for example referred on the one hand to that the patent claim 1 subordinate patent claim as well as on the other hand on the following description in connection with the design.

[0014] In the design the only figure shows a remark example of a plant for the production of a laminar, rolled semi-finished material from an aluminum alloy in accordance with the first theory of the invention and/or. to the implementation of a procedure for the production of such a laminar, rolled semi-finished material in accordance with the second theory of the invention.

[0015] The remark example of the plant for the production of a laminar, rolled semi-finished material according to invention from an aluminum alloy, in particular a semi-finished material for the production of autobody sheets, exhibits a hot-rolling road 1 with a reversing stand 2 and optionally a following multi-level hot-rolling stand 3. In this hot-rolling road 1 an ingot 4 is shifted for example from a standard alloy such as AA5052, AA5754 or AA5182 and aufgehaspelt afterwards in a Aufhaspelstation to a Coil 5.

[0016] After the cooling of the Coils 5 the volume on a first cold rolling mill 6 is submitted to one or more cold-rolling passes, whereby for the reduction of the recrystallisation temperature of the volume the strain amounts to at least 50%.

[0017] Between-annealed with the represented remark example the cold-rolled, again aufgehaspelte volume in a chamber furnace 7. When intermediate annealing the relatively rough structure of the volume recrystallizes almost completely, so that the volume in soft and recrystallized condition is present after the intermediate annealing. Subsequently, the between-annealed volume on a second cold rolling mill 8 is submitted to cold-rolling with a strain again of at the most 30%. Only a small number of defects in the volume is produced by this measure, so that the volume exhibits a fine-grained structure after last cold-rolling.

[0018] Following the last cold-rolling pass the again aufgehaspelte volume in a second chamber furnace 9 of a conclusion annealing is submitted.

[0019] Finally the cooled down volume on a so-called Levelling plant 10 is strained around 0,1 to 0.5%.

[0020] Instead of the Levelling plant 10 also a volume stretching equipment can be used, on which the volume is strained over its entire cross section.